

## WHAT IS CLAIMED IS:

1. An isolated, recombinant, or synthetic protein or fragment thereof that binds with antibodies to the causative agent of Lyme Disease in infected humans or animals, wherein said protein is a homolog of a protein having the amino acid sequence formed by reading in frame the sequence of SEQ ID NO: 14 followed by SEQ ID NO: 2, and wherein said fragment comprises at least 5 consecutive amino acids in length of said protein and wherein said protein or fragment has up to four conservative amino acid substitutions at homologous amino acid positions in the amino acid sequence formed by reading in frame the sequence of SEQ ID NO: 14 followed by SEQ ID NO: 2 or fragments thereof.
2. The protein according to claim 1, wherein said protein is expressed by spirochetes of a *B. burgdorferi sensu lato* strain.
3. The protein or fragment according to claim 1, having at least 50% identity with a protein having the amino acid sequence formed by reading in frame the sequence of SEQ ID NO: 14 followed by SEQ ID NO: 2.
4. The protein or fragment according to claim 1, having at least 85% identity with a protein having the amino acid sequence formed by reading in frame the sequence of SEQ ID NO: 14 followed by SEQ ID NO: 2.
5. The protein or fragment according to claim 1, wherein said fragment is at least eight amino acids in length.
6. The protein or fragment according to claim 1, wherein said protein or fragment is coupled to a substrate that immobilizes said protein or fragment.

7. The protein or fragment according to claim 1, wherein said protein or peptide is coupled to a detectable label or signal~~ing~~-generating reagent.

5 8. A kit for diagnosing infection with a causative agent of Lyme Disease in a human or animal comprising a protein or fragment of claim 1, and at least one of the group consisting of a substrate that immobilizes said protein or peptide, a detectable label, a labeled conjugate, and a signal generating reagent.